Second project –

We will implement a neural network that, when given a greyscale image and an indicator pixel, will produce an image mask. The Mask will cover the object that contains the indicator pixel.

The generated mask image will be used for spot colouring tasks.

Initial Questions:

1. What is the input image? Should be a single image and coordinates within the image.
2. What network will we use? Pre-trained? Newly trained?
3. What is the output? A mask image that has the same dimensions as the input image.
4. How will we generate training data? The most efficient approach may be to find as many spot coloured images as possible and then generate training data based on those images. To generate the mask, we simply convert the coloured area into a mask of 1’s. The rest of the image becomes 0 value.
5. What is the structure of the network? This is particularly relevant with how we will generate the image.
   1. 1 input image and 1 output image?
   2. 2 input images – one greyscale and 1 image with activated pixel.
6. What is the actual learning task?
   1. Classification + coordinates?
   2. In the case of style transfer, they don’t even care about the classification. They just care about the generated image. The error function is a difference between the intermediate image and the style image. So they are relying on the error of the various layers.
   3. So what can we do?
      1. NN – Object/feature extraction? Does this mean we can simply utilize the VGG network. The VGG network already knows how to identify the various objects. It also knows how to identify features.
      2. Can we re-use the same technique? Potentially, but we have to change the error function. Currently error function is a summation of every layer’s gram matrix difference. How would we change the error function? David suggested that we can feed in a second image that is the pixel, with distances from the pixel. Can we use the distance map multiplied against gram matrix? What does this actually represent?
7. Is the task – find the area around the selected pixel that has similar colour? Find the region around the selected pixel that has similar colour?
   1. Find the area around the selected pixel, where the object that was selected will retain its colour. If we specify it this way, we can generate many artificial training images based on simple objects or aggregate objects. We can write a generator that will create the training data.
   2. Find the area around the selected pixel where the selected object, up to logical boundaries, will retain its colour. Similar to 7a, we can also generate a trainer.
   3. When worded this way, we don’t really care about recognizing objects, we just care about finding the boundaries to objects.
   4. In terms of difficulty, finding a region may be easier than finding the absolute boundary.
   5. The data generator can also utilize sample images, it doesn’t need to utilize only basic shapes.
   6. In this particular task, what should be the output?
      1. Coordinates for the center of a circle with a radius?
      2. Image mask? This would follow some criteria – either colour differential from the selected pixel or gradient/colour differential from selected pixel.
8. First go around, create a NN that will take two images as input. The images are the same 2D dimensions. Both images are greyscale.
   1. The output will be a mask based on the input image.
   2. Create a simple image generator that produces colour images as well as the greyscale version of the image. It will also create an image that has the selected pixel. The selected pixel will either be on the generated image or outside the generated image. The generator can also produce the expected result.

General reading about CNN:

<https://medium.com/machine-learning-bites/deeplearning-series-convolutional-neural-networks-a9c2f2ee1524>

Some reading on detecting objects as well and determining it’s location: <https://medium.com/machine-learning-bites/deeplearning-series-objection-detection-and-localization-yolo-algorithm-r-cnn-71d4dfd07d5f>